Table 3, where the effect of variation of the notch shape on various mechanical properties is shown under the following headings: type of steel; number of the specimen in Fig. 1; $\sigma_{B.H.}/\sigma_B$; $\sigma_{Z.H.}/\sigma_Z$; δ_H/δ ; ψ_H/ψ ; $\sigma_{B.H}$, $\sigma_{Z.H.}$, δ_H and ψ_H denote, respectively, the UTS, true tensile strength, elongation, and reduction of area of the notched test pieces, σ_B, σ_Z, δ and ψ denoting the same properties of the unnotched specimen (specimen No. 1 in Fig. 1); each property of a notched specimen is therefore expressed in this table in % of this property of the unnotched test piece. The results of impact tests are reproduced in Fig. 3, where the impact strength (a_k, kgm/cm^2) is plotted against the test temperature ($^\circ$C), the four diagrams (from top to bottom) relating to steels 30ХГВТ (30KhGVT), 30ХГВМ (30KhGVM), 30Х2ГМТ (30Kh2GMT) 35ХНМ (35KhNM) and 40ХН (40KhN); the continuous curves relate to material in ductile condition, the brittle and semi-ductile condition being indicated by broken and dotted curves.

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On brittle fracture of alloy steel

respectively. It was concluded that the Cr-Mn steel, containing approximately 0.3% C and additions of other carbide-forming elements, differs little from the Cr-Ni-Mo steels in respect to their tendency to brittle fracture under conditions of stress concentration. Steel 30Kh2GMT is least notch-sensitive, steels 30KhGVT, 30KhGVM and 35KhNM are approximately equal in this respect, steel 40KhN being most sensitive to the action of stress concentration. The effect of the degree of notch sharpness on strength and plasticity of the Cr-Mn steel was found to be similar to that observed in steel 35KhNM; the effect of stress-risers was particularly pronounced in steel 40KhN. It was found also that the notch-sensitivity and tendency to temper-brittleness can be assessed by static bending tests conducted on notched bar test pieces; assessed in this manner, steel 30KhGVM proved to have relatively high tendency to brittle fracture. The results of the impact tests showed that in respect to the tendency to temper brittleness and the ductile-to-brittle transition temperature steels 30KhGVT, 30KhGVM and 30Kh2GNT are similar to steel 35 KhNM, steel 40KhN being characterised by a relatively higher tendency to

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28867
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On brittle fracture of alloy steel E193/E383

temper brittleness and a higher ductile-to-brittle transition temperature. It was inferred from the results of the present investigation that steels 30KhGVT and 30Kh2GMT can be recommended as substitutes for the Cr-Ni and Cr-Ni-Mo steels in the fabrication of machine components of complex shape, whereby considerable economies in the consumption of nickel and cobalt, which are not easily available can be attained.
There are 5 figures and 5 tables.

SUBMITTED: October 10, 1960

Card 5/5

18 1111

26584

S/148/61/000/006/008/013
E111/E480

AUTHORS: Braun, M.P., Vinokur, B.B. and Kondrashev, A.I.

TITLE: Influence of niobium on the form of fracture of alloyed structural steel

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Chernaya metallurgiya, 1961, No.6, pp.119-124

TEXT: Numerous investigations into the fracture of steel hardened and then tempered at 500 to 650°C with very rapid or very slow cooling showed that the forms of fracture after impact testing at +300 to -200°C can in the main be classified in five groups. The author used this classification in studying the effect of niobium on the form of fracture in structural chromium-nickel and chromium-manganese-nickel steels. The following compositions were tested

		C	Mn	Si	Cr	Ni	Nb	S	P
Cr—Ni—Nb . . .	*B*	0,30	0,35	0,13	1,29	1,52	0,33	0,032	0,18
Cr—Ni—Nb . . .	*C*	0,33	0,40	0,31	1,27	1,57	0,71	0,020	0,020
Cr—Ni—Nb . .	*K*	0,35	0,41	0,27	1,31	1,57	0,90	0,037	0,020
Cr—Ni—Mn—Nb .	*A*	0,36	0,99	0,30	1,01	1,58	0,10	0,018	0,022
Cr—Si—Mn—Nb .	*B*	0,25	1,25	1,07	1,33	0,21	0,09	0,019	0,022

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Impact specimens were oil-quenched from 860 and 1000°C and tempered at 500, 550, 600 and 650°C with subsequent cooling in water at 20°C to give a ductile, and in the furnace (at 0.3°C/min) to give a brittle, initial state. Impact tests were effected at +300°C to -200°C. The results showed that alloying of chromium-nickel steel with niobium to over 0.7% greatly impairs the form of fracture. (Abstractor's note: This is in the authors' own words although the next sentence suggests "improves".) Curves of toughness (kgm/cm^2) as a function of test temperature (°C) for the steel C (S), tempered at 500, 550, 600 and 650°C, confirm the indications given by the form of fracture and show the satisfactory toughness and the low tendency to reversible temper brittleness (Fig.4: plots a, б, в, г - oil quenched from 800°C; plot д - oil quenched from 1000°C; curves 1 - tough state, curves 2 - brittle state). To find the effect of holding time on the form of fracture, impact test pieces of steels Б (B), S and K, oil-quenched from 860°C and tempered for 2 hours (650°C, and cooling), were held for 50, 100, 500 and 1000 hours at 650°C and then tested at +300 to -200°C. The general conclusion from the work is that

alloying of the test steels with 0.1% Nb does not affect the fracture; with 0.3 to 0.6% the ductile fracture is preserved to low test temperatures irrespective of the initial state of the steel; with over 0.7%, brittle crystalline fractures are produced. With over 0.9% grains of niobium carbide are visible in the microstructure but these should increase rather than decrease plasticity. Crystal fragments in ductile fractures could be due to enrichment of some crystal planes with carbon and alloying elements. The most surface active elements are probably carbon, silicon, phosphorus and aluminium with respect to austenite, and phosphorus, silica, nickel, manganese and chromium with respect to ferrite. The quantitative calculation of the adsorption effect has been described by M.P.Braun in his book"Izlom i khrupkost' konstruktsionnoy legirovannoy stali"(Fracture and Brittleness of Structural Alloy Steel), Mashgiz, 1960. There are 5 figures, 1 table and 1 Soviet reference.

ASSOCIATION: Institut liteynogo proizvodstva AN UkrSSR i NKMZ im. Stalina (Foundry Production Institute AS UkrSSR and NKMZ imeni Stalin)

BRAUN, M.P.; VINOKUR, B.B.; KONDRASHEV, A.I.; GELLER, A.L.

Chromium-manganese base steel for large forgings. Izv. vys. ucheb. zav.; chern. met. 4 no.8:108-111 '61. (MIRA 14:9)

1. Ukrainskaya akademiya sel'skokhozyaystvennykh nauk.
(Chromium-manganese steel)

2808
1118, 1573

10 9230

S/032/61/027/003/015/025
B101/B203

AUTHORS: Braun, M. P. and Kostyrko, O. S.

TITLE: Temper embrittlement of steel in connection with the size effect

PERIODICAL: Zavodskaya laboratoriya. v. 27, no. 3, 1961, 318-321

TEXT: The dependence of brittleness on the specimen volume has often been studied in stretch and bending tests. Few papers have, however, been published on the effect of the size factor when testing the brittleness by means of Charpy impact machines. The present investigation attempts to obtain more data on the impact strength of steel in the brittle and viscous state. The authors studied 40ХН (40KhN) steel which has a marked tendency to temper embrittlement. To obtain maximum temper embrittlement they made preliminary tests. Ten specimens 10×10×55 mm were hardened at 1000°C, and tempered at 500, 550, 600, 640, or 680°C for 1 hour. Five specimens were quenched in water, the others were quenched in the furnace to 550°C at 10°C per hour. Results (Fig. 1) showed a maximum difference of impact strength between 550 and 600°C; therefore, a temperature of 570°C was

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S/032/61/027/003/015/025
B101/B203

chosen for further tests. To attain good tempering in specimens of different sizes, they were annealed at 1100°C for 5 hours, then tempered in oil at 1000°C for 1 hr. A uniform hardness of 56-59 at a depth of up to 37 mm in the specimen was attained (size of specimen 40×40 mm). To obtain comparable results, geometrically similar specimens were used: 10×10×55; 15×15×83; 20×20×110; 30×30×165, and 40×40×220 mm. The impact tests were made at room temperature by an impact machine of 30, 75, and 250 kgm power. Table 2 shows the results. It was found that in the absence of temper embrittlement specimens had a considerable reserve of impact strength which increased with increasing specimen size. Fig. 2 shows the change in impact strength in the brittle and viscous state as a function of specimen size. A study of the fine structure showed that the grain boundaries were slightly etched in the brittle state. A dependence of the etching effect on the specimen size was not observed. It is concluded that the experimental values for standard specimens cannot be applied to large workpieces whose impact strength is much higher. In the case of temper embrittlement, the impact strength increases much less with increasing specimen size than in the viscous state. A study of fractured surfaces showed that every brittle fracture was preceded by noticeable plastic deformation. M. I. Vinograd

Temper embrittlement of steel ...

is mentioned. There are 3 figures, 3 tables, and 9 references: 6 Soviet-bloc and 3 non-Soviet-bloc.

ASSOCIATION: Institut liteynogo proizvodstva Akademii nauk USSR (Institute of Founding of the Academy of Sciences UkrSSR)

Legend to Fig. 1: a) tempering temperature; b) impact strength

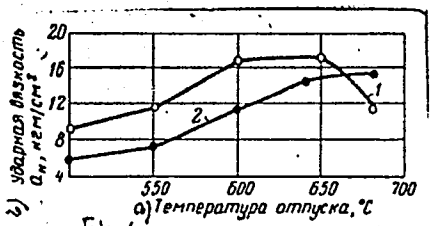

Fig. 1

Fig.1

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Legend to Table 2: Change in impact strength (a_H, kgm/cm^2) and in impact energy (A_H, kgm) with increasing specimen size: 1) size of specimens, mm; 2) viscous state, 3) specimens were not destroyed but bent to 11°, 4) a crack up to 24 mm long was formed, 5) average, 6) brittle state

1

10×10		15×15		20×20		30×30		40×40	
$A_м$	$a_м$	$A_н$	$a_н$	$A_н$	$a_н$	$A_н$	$a_н$	$A_н$	$a_н$
2 Вязкое состояние									
11,8	14,8	35,0	20,2	75,0	23,8	250	35,5	3 Образцы не разрушились, а изогнулись до 11°. 4 Наблюдалась слабая трещина длиной до 24 мм	
11,2	13,9	35,0	19,9	75,5	24,1	250	35,1		
11,4	14,2	30,6	18,1	73,0	23,4	248	34,5		
12,1	15,1	34,2	19,6	70,5	22,4	246	34,8		
5 Среднее	14,5		19,5		23,4		35,0		
6 Хрупкое состояние									
8,1	10,1	19,1	11,0	38,0	13,0	121	17,1	216	17,2
7,6	9,5	21,3	12,1	35,5	11,3	117	16,2	205	16,5
8,4	10,4	20,6	11,8	37,0	12,6	108	15,1	218	17,1
7,8	9,8	21,1	12,2	38,5	13,2	116	16,2	221	17,5
5 Среднее	9,9		11,8		12,5		16,2		17,2

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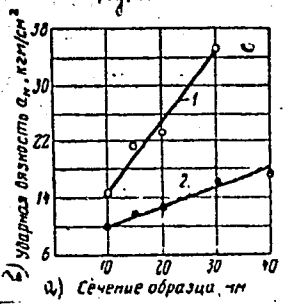
B101/B203

Temper embrittlement of steel ...

Legend to Fig. 2: a) cross section of specimen, mm×mm; b) impact strength

Fig. 2



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2808

26385
S/032/61/027/008/008/020
B107/B206

18.9100

AUTHORS: Braun, M. P. and Tikhonovskaya, L. D.

TITLE: Use of the secant plane method for investigating the deformation distribution in ЭИ726 (EI726) steel

PERIODICAL: Zavodskaya laboratoriya, v. 27, no. 8, 1961, 984-986

TEXT: The authors investigated the change of grain size and degree of deformation during forging at 1000°C. The specimens used were of heat-resistant ЭИ726 (EI726) steel. The dimensions of the specimens and the degree of deformation are given in a table. The specimens are of symmetrical structure, and the axis of symmetry coincides with the axis of deformation. All specimens were therefore divided into four parts along the axis, and one half was cut off from such a quarter. Polished sections were prepared from these specimens. The structure was investigated at four points: close to the surface in the center, and at a distance of one-third and two-thirds from the center. The method of secant planes was applied (Ref. 1: S. A. Saltykov, Stereometricheskaya metallografiya, Metallurgizdat (1958)). Under the effect of pressure, the total length of the grain boundaries

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Use of the secant plane method...

ΣL_{tot} may be used as a criterion for the change of grain size: $\Sigma L_{tot} = \Sigma L_{iso} + \Sigma L_{or}$. Here, ΣL_{iso} is the specific grain boundary length of the isometric part, and ΣL_{or} is the specific grain boundary length of the oriented part of the system. $\Sigma L_{iso} = 2M_{\parallel}$ $\Sigma L_{or} = M_{\perp} - M_{\parallel}$, where $M_{\parallel}$ is the number of nodal points of grain boundaries of flat grains in the plane perpendicular to the axis of deformation per mm^2 of the ground section, $M_{\perp}$ is the number of nodal points of grain boundaries of flat grains in the planes parallel to the axis of deformation. The degree of orientation μ of the grain boundaries of drawn grains is then determined by the relation: $\mu = (\Sigma L_{or}/\Sigma L_{tot}) \cdot 100\% = [(M_{\perp} - M_{\parallel})/(M_{\perp} + M_{\parallel})] \cdot 100\%$. Fig. 1 shows the relation between the degree of orientation and the distance from the specimen center. It may be seen therefrom that the orientation rises at an increased degree of deformation with an approach to the central part of the specimen. At a deformation by 15 %, the maximum degree of orientation lies at a distance of one-third from the center. At the investigated points of the longitudinal and transverse ground sections, the degree of structural deformation was determined from the following

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Use of the secant plane method...

formulas: for transverse ground sections: $\alpha_1 = 100\% \cdot (M_0 - M_n)/M_0$; for longitudinal sections: $\alpha_2 = 100\% \cdot (M_n - M_0)/M_n$. M_0 is the number of nodal points of grain boundaries at the investigated points of the casting, M_n the number of nodal points of grain boundaries of the investigated points of forged specimens. Fig. 2 gives the results of this investigation. The degree of structural deformation is the higher, the greater is the volume deformation. For the specimen deformed by 15 %, the maximum degree of structural deformation and the maximum orientation lie at a distance of one-third from the center. This is connected with the fact that for these specimens the ratio of height to diameter is greater than unity: H:D = 1.73; for specimens deformed by 30 and 45 %, this ratio is smaller than unity, i. e., 0.99 and 0.74, respectively. In order to verify the results mentioned, the degree of structural deformation was calculated from the change of the grain faces (see Table). The results fully agree with those obtained by S. A. Saltykov's secant method. [Abstracter's note: Complete translation.] There are 2 figures, 1 table, and 1 Soviet reference.

ASSOCIATION: Institut liteynogo proizvodstva Akademii nauk USSR

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B107/B206

Use of the secant plane method...

(Institute of Casting Processes of the Academy of Sciences UkrSSR)

Card 4/7

BRAUN, Mikhail Petrovich, doktor tekhn. nauk, prof.; PERMYAKOV, V.G., doktor tekhn.nauk, retsenzent; NOVIK, A.M., red.izd-va; MATUSEVICH, S.M., tekhn. red.

[Effect of addition elements on the properties of steel]Vliianie legiruiushchikh elementov na svoistva stali. Kiev, Gostekhizdat URSR, 1962. 190 p. (MIRA 16:3)
(Steel alloys—Metallurgy)

S/743/62/000/001/001/008

AUTHORS: Vinokur, B. B., Braun, M. P.

TITLE: The transformation of austenite in chrome-manganese- and chrome-nickel-based steels.

SOURCE: Struktura i svoystva litykh splavov. no.1. Inst. lit. proizv. AN USSR. Kiev, Izd-vo AN UkrSSR, 1962, 18-26.

TEXT: The paper reports the results of an experimental investigation of high-strength quench-hardenable steels with reference to the austenite transformation. It concludes that the kinetics of the transformation of supercooled austenite during continuous cooling and under isothermal conditions is identical for Cr-Ni and Cr-Mn steels, and that these two types of alloyed steels are, therefore, interchangeable. In either type of steel the isothermal diagram is fairly complicated: Two minimums of austenite stability, corresponding to the perlitic and intermediate regions, are observed, and between them a region of elevated stability of supercooled austenite prevails. Of the two steels, the critical cooling rates for the attainment of the perlitic and bainitic transformations are smaller in the Cr-Mn steel, i.e., this steel possesses a somewhat greater deep hardenability. If a Cr-Mn-Ni steel is further alloyed with W, the kinetics of the austenite transformation is analogous

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to the kinetics of the transformations of Cr-Ni-Mo steel with a Ni content up to 3%. The presence in a Cr-Ni steel of Mo is conducive not only to a greater austenite stability in the perlitic and intermediate regions, but increases its stability in the T interval from 510-575°C likewise, so that no decomposition of supercooled austenite is observed after isothermal .36-hr soaking. Comparative data (tabulated) indicate that steels with 2 or 3 alloying elements increase, at times by several tens of times, the stability of the austenite in the perlitic and especially in the intermediate region, and invariably decrease the critical rates of perlitic and bainitic hardenability and also the minimal rate for the completion of bainitic transformation (data tabulated). The multiply-alloyed steels 30XГBT (30KhGVT) and 30XГMT (30KhGMT) and the Ni-containing steels 35XHM (35KhNM) and 35XN2M (35KhN2M), in all of which the austenite is highly stable, appear mutually interchangeable for machine parts of large cross-section, since the alloying elements in these steels exert identical effects on the kinetics of the austenite transformation. The thermokinetic and isothermal diagrams and the effect exerted by the alloying elements on the strength, plasticity, toughness, and temper-brittleness tendency of steels, can serve for the accurate establishment of the maximum permissible sizes of machine parts in which the necessary properties can be obtained. The analysis of the austenite-transformation diagrams was usefully employed to select a steel that does not contain high-cost, scarce, alloying elements. Thus, multiple alloying was used

to obtain a high-strength steel without Ni. The steel developed was the 30KhGVT which replaces not only the steel 40XH (40KhN) for parts of any size, but also steel 30KhNM for parts up to 500 mm in cross-sectional size. For highly stressed parts in which 35KhNM steel is currently used, steel 30Kh2GMT was developed, which because of its excellent hardenability and other properties can also be used to replace steel 35KhN2M. There are 5 figures, 2 tables, and 6 Russian-language Soviet references.

ASSOCIATION: Institut liteynogo proizvodstva, AN USSR (Institute of Casting Production, AS UkrSSR).

S/743/62/000/001/002/008

AUTHORS: Vinokur, B.B., Braun, M.P.

TITLE: The hardenability of multiply-alloyed chrome-manganese steel.

SOURCE: Struktura i svoystva litykh splavov. no.1. Inst. lit. proizv. AN USSR. Kiev, Izd-vo AN UkrSSR, 1962, 36-44.

TEXT: The paper reports the result of an experimental investigation of the scale factor on the hardenability in the production of large machine parts. The direct objective of the investigation was the development of a Ni-free high-strength, hardenable, steel by means of the supplementary alloying of Cr-Mn steel by carbide-forming elements, which would help to achieve a high level of mechanical properties without incurring appreciable temper-embrittlement. It was found that the hardenability of multiply-alloyed Cr-Mn steel is so deep that a critical diameter was not attainable with the use of a plane-faced specimen 25 mm in diam. A comparison of the curves of the lengthwise change in hardness shows that the Cr-Mn-Ti steels 30X2Г2MT (30Kh2G2MT) and 30X2ГMT (30Kh2GMT) possess the greatest hardenability. The hardenability of steels 30KhGVM, 40KhGVT, and 35KhNM are identical. Steel 30KhGVT is slightly less hardenable; its hardness-variation curve is some 7-9 units of R_C lower than that for 40KhGVT. Steel 40KhN is least deep-hardenable. A second method for the determination of the hardenability, namely, the calculational method using factors, was employed. This method consists in expressing the hardenability of a given steel by the number 1 plus a factor times the % of an individual

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alloying element. Using the ideal critical diameter of a pure FeC alloy, which depends on the size of the austenite grain and the C content, and multiplying this initial quantity by the respective multiplying factors for each element, the critical diam for a steel of a given composition can be established. The determination of the hardenability of the various steels investigated by means of this calculational method yields the same quality sequence of the various steels with respect to changes in hardenability. The steel 30Kh2GMT has a critical diam, with inhibition of the perlitic transformation at the center of the section, twice as great as that of steel 35KhNM and 3.5 times as great as steel 40KhN. The hardenability of the steels 35KhGVT is found to be twice as deep as for the steel 40KhN. It is found that the most accurate results for the determination of the hardenability of steels are obtained by overlaying the cooling curves of parts of different cross-section onto the thermokinetic diagrams for the steels, whereupon it is possible to determine not only the critical diameter but also the structure of the steel at any desired point of the cross-section. The hardenability investigation shows that Cr-Ni and Cr-Ni-Mo steels can be replaced by multiply-alloyed Cr-Mo-based steels without any Ni. There are 1 figure and 4 tables; no references.

ASSOCIATION: Institut liteynogo proizvodstva, AN USSR (Institute of Casting Production, AS UkrSSR).

S/743/62/000/001/003/008

AUTHOR: Braun, M. P.

TITLE: Effect of inoculating additions on the mechanical properties of cast alloyed steel.

SOURCE: Struktura i svoystva litykh splavov. no.1. Inst. lit. proizv. AN USSR. Kiev, Izd-vo AN UkrSSR, 1962, 45-53.

TEXT: The paper describes an experimental investigation intended to ascertain the usability of steels with readily available alloying elements, such as Cr, Mn, Si, and others, in which elevated strength, plasticity, and toughness are to be obtained. Such an elevated level of mechanical properties is attained in Cr-Si-Mn steels additionally alloyed with Ni (0.25% C, 1.26% Cr, 1.42% Si, 1.09% Mn, 1.14% Ni) and in Cr-Si steel additionally alloyed with Ni (0.25%C, 1.2% Cr, 1.98% Si, 1.33% Ni). The various inoculating additions have differing effects upon the steel. The σ_b and σ_s is most effectively increased by inoculation with Se of Cr-Si-Mn-Ni and Cr-Si-Ni steels. In a Cr-Mn-Ni (0.5% Si) steel the Se increases both the plasticity and the toughness properties; inoculation of this steel with V improves its properties appreciably, whereas in other steels such improvement is not observed. The inoculation of Cr-Si-Mn-Ni steel with Ti or Nb does not enhance its properties.

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On the contrary, in Cr-Si-Ni and Cr-Mn-Ni steels such inoculations impair the toughness and plasticity and even the strength properties. The difference in the behavior of the inoculating additions becomes manifest from an examination of the nature of a given element and the degree of alloying of the material: A steel alloyed with the Cr-Si-Mn-Ni complex (5%) has an α-phase (Martensite) that is sufficiently saturated with solute elements, and an inoculation with the small additions under investigation here cannot alter the basic structure of the hardened steel to any substantial extent. Cr-Mn-Ni and Cr-Si-Ni steels the α-phase of which is less saturated are more sensitive to the influence of inoculating additions. Most effective as an inoculant here is Se, since it enters into the α-phase solid solution and lends it additional strength. V and Zr, also, dissolve partly in the α-phase and are not fully retained in dispersed carbide form. In either instance, the α-phase is strengthened both in the grain itself and along the grain boundary. The unfavorable effect of inoculation with Ti and Nb is attributable to the entry of these elements in toto into the composition of the individual carbides which are not dissolved in the α-phase. These carbides are preserved in their enlarged form and impair the strength of the α-phase grain boundaries. The following inoculated high-strength cast steels are found to be of distinctive quality: (a) A Cr-Mn-Ni steel inoculated with V (0.25% C, 1.20% Cr, 1.20% Mn, 1.20% Ni, and 0.10% V); (b) a Cr-Mn-Ni steel of the same composition inoculated with Zr (0.10-0.15%) or Se

(0.05-0.11%); (c) a Cr-Si-Ni steel (0.25% C, 1.20% Cr, 1.20% Si, 1.20% Ni), inoculated with Zr (0.15%) or Se (0.05%). There are 3 figures, 2 tables, and 8 references (6 Russian-language Soviet and 2 English-language U.S.: Nickelson, C., Iron Age, v.179, 1957, 95, and Jackson, W., Michie, G., J. Iron & Steel Inst., v.187, 1957, 2).

ASSOCIATION: Institut liteynogo proizvodstva, AN USSR (Institute of Casting Production, AS UkrSSR).

S/743/62/000/001/005/008

AUTHORS: Geller, A. L., Braun, M. P., Vinokur, B. B.

TITLE: The effect of the pre-quench temperature on the properties of multiple-alloy steels.

SOURCE: Struktura i svoystva litykh splavov. no.1. Inst. lit. proizv. AN USSR. Kiev, Izd-vo AN UkrSSR, 1962, 76-81.

TEXT: The paper adduces the results of experimental investigations on Cr-Mn steels additionally alloyed by strongly carbide-forming elements, which lead to the formation of a complex alloyed carbide of the cementite type, which has a relatively low temperature of dissolution in austenite. It is found that a carbide-forming element is dissolved partly in the multiply-alloyed cementite. In this process the bonding forces between the element and the C are significantly weakened; this effect leads to a lowering of the dissolution temperature in the austenite of the alloyed carbide to a value that is lower than that of the individual carbide by itself but higher than that of the cementite. Secondly, a part of the element introduced combines with the C, forming a separate carbide of the type MeC (Me=metal), which is highly austenite-dissolution resistant. However, the formation of the separate carbide engenders separation of the parts of the alloyed cementite, i.e., the freeing

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of the alloying elements from the carbide and their transfer into the solid solution, which in turn compensates, as it were, for the loss of C and leads to a hardening of the solid solution and an elevation of its hardenability. The investigation was focused primarily on the determination of the effect of the pre-quench temperature on the degree of dissolution of the carbide-forming elements in the austenite by means of the dilatometric method. The influence of the pre-quench temperature on the position of the critical points during cooling are investigated for steels 30ХГВТ (30KhGVT), 30ХГВМ (30KhGVM), and 30Х2Г МТ (30KhGMT), and are shown graphically for cooling in the furnace and in air. It is found that, if steel is alloyed with a Ti-containing complex, the quench temperature for the obtainment of elevated mechanical properties with minimal tendency toward temper-brittleness must exceed the upper critical point by 80-100°C. It is concluded that steels 30KhGVT and 30Kh2GMT must be quenched from a temperature of 900° to obtain optimal mechanical properties and suppress temper-brittleness. An increase in pre-quench temperature from 850° to 920°, for example, improves the tensile strength by 13 kg/mm^2 and the yield limit by 16 kg/mm^2. There are 3 figures and 3 tables. No references.

ASSOCIATION: Institut liteynogo proizvodstva, AN USSR (Institute of Casting Production, AS UkrSSR).

S/743/62/000/001/006/008

AUTHOR: Braun, M. P.

TITLE: Reduction of the brittleness of chrome-manganese-silicon steel by additional multiple alloying.

SOURCE: Struktura i svoystva litykh splavov. no.1. Inst. lit. proizv. AN USSR. Kiev, Izd-vo AN UkrSSR, 1962, 95-101.

TEXT: The paper reports the results of an experimental investigation of the brittleness of Cr-Mn-Si steel upon supplementary alloying with the alloying complexes Ni + W + Ti, Ni + Cu, Mo + Ti, Mo + Ti + Al, and Ni + Mo + Ti. Alloying with a suitable alloying complex is found to reduce the development of cold-brittleness significantly. Addition of the Ni + W + Ti complex results in a weakening of the tendency toward brittleness of the first kind (temperature dependence). Whereas the minimal notch-toughness after 500° to 550°C temper is 5-6 kgm/cm^2, it increases with increasing tempering temperature and attains 13 kgm/cm^2 at 650° and 18 kgm/cm^2 at 700°. The same addition improves the brittleness characteristics of the second kind, i.e., those dependent on the rate of cooling after tempering. In general, an increase in Cr and Mn in a Cr-Mn-Si steel enhances the development of brittleness. However, the additional alloying of a steel with a Mo + Ti + Al complex can significantly reduce its embrittlement. A low-temperature investigation shows that the multiple alloying of Cr-Mn-Si steel with additions of Ni + Mo + Ti or W + Ti

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complexes increases its toughness, and the cold-brittleness threshold is transferred into the -60 to -70°C temperature range. The most likely explanation of the temper-embrittlement process in steel is the development of intergranular adsorption and segregation of atoms dissolved in the grain in the course of a slow cooling after tempering or aging in the embrittlement-temperature range. The so-called "equilibrium segregation" lowers the bonding force at the lattice discontinuities, especially on the austenite-grain boundaries. It is postulated that the brittle grain boundaries, under etching, become cathodes with respect to the grains themselves, whereupon the solute atoms become redistributed and atoms of a given kind are accumulated at certain locations. The supplementary alloying of Cr-Mn and Cr-Mn-Si steels with Mo, W, or V increases the energy of attraction, a process which hinders the intergranular segregation and hence the embrittlement. It is noted that the multiply-alloyed steels 35ХГНВТ (35KhGNVT), 35ХГ Н2ВТ (35KhGN2VT), and 35ХГ2ФТ (35KhG2FT) are identical in brittleness characteristics to the Cr-Mo steels 35ХНМ (35KhNM), 35ХН2М (35KhN2M), et al. There are 5 figures and 14 references (11 Russian-language Soviet and 3 English-language: Parker, E., Brittle behavior of Engineering Structures, London, 1957; Rinebolt, I., Harris, W. Trans ASM, v.43, 1951, 1175; Powers, A., J. Iron & Steel Inst., v.186, 1957, 323).

ASSOCIATION: Institut liteynogo proizvodstva, AN USSR (Institute of Casting Production, AS UkrSSR).

S/743/62/000/001/007/008

AUTHORS: Kostyrko, O.S., Braun, M.P.

TITLE: The development of temper brittleness upon a change in the sectional magnitude of impact specimens.

SOURCE: Struktura i svoystva litykh splavov. no.1. Inst. lit. proizv. AN USSR. Kiev, Izd-vo AN UkrSSR, 1962, 102-115.

TEXT: The paper reports the results of an experimental investigation intended to obtain more complete data on the dependence of the notch-toughness on the scale factor in conditions of geometric similarity and structural equality of the specimens studied and with the specimen in a state of reversible temper brittleness or in its absence. The specimens were made of rolled billets of 40XH (40KhN) steel. The billets of the impact specimens were first annealed at a temperature of 1,100°C for 3 hrs to obtain uniform grain structure and were quenched in oil from a temperature of 1,000°C. Tests reported in Zavodskaya laboratoriya, v.27, 1961, 318, show that the specimens were fully hardened across their thickness. Upon 2-hr tempering at 570°, one-half of the specimens were cooled in water, the other half in the furnace at a rate of 10°C/hr. H_{RC} of the specimens ranged within 25-27. Notch-toughness tests were performed at T from +200 to −180°C. The tabulated and graphed test data show that, with an increase in the size of the specimen, the level of notch-toughness increases both for steel heat-treated for reversible temper

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brittleness and for steel not subjected to such treatment. With increasing specimen size the notch-toughness increases significantly more intensely in the absence of reversible temper brittleness than in its presence. The increases in notch-toughness occur according to a linear law. The character of the change of the curves and the appearance of the fracture does not suggest a displacement of the critical transition temperature in the brittle state toward higher T's with increasing specimen size. If we define the cold-brittleness threshold as corresponding to a 50% decrease in toughness, then the magnitude of the cold-brittleness interval approximates 75°C. A comparison with the planimetric method yields similar results. The dependence of the impact work on the deformation characteristic Δb has a rectilinear character. The deformation characteristic Δb increases in magnitude with increasing specimen size, both in the presence and in the absence of reversible temper brittleness. The coefficient of proportionality, $K=A_k/\Delta b$, grows in absolute value with a growth in specimen size; however, the ratio $K_{furnace}/K_{water}$ changes but insignificantly. There are 3 figures, 2 tables, and 15 references (10 Russian-language Soviet, 2 German, 1 Swedish, and 2 English-language).

ASSOCIATION: Institut liteynogo proizvodstva, AN USSR (Institute of Casting Production, AS UkrSSR).

S/743/62/000/001/008/008

AUTHORS: Chernyy, V.G., Gusliyenko, Yu.A., Braun, M.P.

TITLE: Selection of a heat-treatment regime for a cast heat-resistant nickel-based alloy.

SOURCE: Struktura i svoystva litykh splavov. no.1. Inst. lit. proiz-v. AN USSR. Kiev, Izd-vo AN UkrSSR, 1962, 129-134.

TEXT: The paper describes an experimental investigation intended to study the factors that determine the strength characteristics at ordinary and elevated temperatures of a cast multiply-alloyed high-temperature Ni alloy. The investigation was performed by means of X-ray diffraction analysis, which indicated the dependence of the dimensions of the mosaic blocks of the matrix and of the intermetallic phase of the alloy on the temperature (T) and the pre-quench holding time, as well as the variation of the magnitude of the nonuniformity of the crystalline-lattice parameter of the alloy, the crystalline-lattice parameters and the magnitude of the distortions of the third kind in the crystalline lattices of the intermetallic compounds and the matrix, and the composition of the carbide phases. The investigations were conducted on the УРС-50И (URS-50I) diffractometer and the УРС-55 (URS-55) X-ray equipment with Cu, Cr, and Co radiation. The dimensions of the blocks of

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the intermetallic phase were determined by the width of the (111) interference line. The dimensions of the blocks of the matrix mosaic of the alloy and the non-uniformity of its lattice parameter were obtained by means of a harmonic analysis of the shape of the (111) interferences. In addition, the dimensions of the matrix blocks of the alloy were determined from the change in the integral intensity of the (111) lines. Corrections for the non-monochromaticity of the radiation and the geometric conditions of the experiment were introduced. The investigation comprised tests of the following characteristics also: Modulus of elasticity (ME), characteristic temperature, dynamic distortions of the crystalline lattice, grain size, tensile strength, Vickers hardness, amount of intermetallic phase, and microstructure. The characteristic temperature and the magnitude of the dynamic distortion were calculated from the ME data. Upon suitable heat treatment, the alloy contained two basic phase components, the solid solution and the Ni_3Al intermetallic phase, both of which have a face-centered cubic lattice with parameters close in absolute magnitude (3.57 Å). In addition, an alloyed (Ti, Cr, W) C carbide appears after quench. Other carbides detected: Cr_7C_3, $(Cr, Fe, W, Mo)_{23}C_6$, Fe_3W_3C, and the Ni_3Ti phase. Most stable are the (Ti, Cr, W) C and the Cr_7C_3 phases. The carbide phase of the alloy quenched at 1,280°C contains approximately 75% (Ti, Cr, W) C, 20% Cr_7C_3, and 5% of the other carbides. Because of the

exceedingly complex alloying, the alloy manifests an inertness with respect to heat treatment; however, after quenching from 1,200-1,225°C, its properties are improved. The T of 1,225° lies above the solubility boundary of the intermetallic phase. A suitable heat treatment of this alloy consists of quenching from T 1,225° after 2-hr holding at that T. An additional reheating of the quenched alloy to T from 700-850° leads to an increase in its hardness from 406 kg/mm^2 after quenching alone to 450 kg/mm^2 after quenching & reheat to 800°C. However, reheating to 1,050° reduces the hardness of the alloy to 340 kg/mm^2. There are 2 figures and 5 Russian-language Soviet references.

ASSOCIATION: Institut liteynogo proizvodstva, AN USSR (Institute of Casting Production, AS UkrSSR).

BRAUN, M.P.

Some aspects of the theory of steel alloying. Struk.i svois.lit. splav. no.1:5-17 '62. (MIRA 15:5)
(Steel alloys—Metallurgy)

VINOKUR, B.B.; BRAUN, M.P.

Austenite transformations in chromium-manganese and chromium-nickel base steels. Struk.i svois.lit.splav. no.1:18-26 '62. (MIRA 15:5)
(Chromium steel--Metallography) (Phase rule and equilibrium)

PLETNIK, R.I.; BRAUN, M.P.

Studying the kinetics of austenite transformation in high-strength cast iron during continuous cooling. Struk.i svois.lit. splav. no.1:27-35 '62. (MIRA 15:5)
(Cast iron--Metallography) (Phase rule and equilibrium)

VINOKUR, B.B.; BRAUN, M.P.

Hardenability of complex-alloy chromium-manganese steel. Struk.i svois.lit.splav. no.1:36-44 '62. (MIRA 15:5)
(Chromium-manganese steel--Hardening)

BRAUN, M.P., doktor tekhn.nauk

Isothermal hardening of high-strength high-alloyed steel.
Mashinostroenie no.1:37-41 Ja-F '62. (MIRA 15:2)

1. Institut liteynogo proizvodstva AN USSR.
(Steel alloys--Heat treatment)

BRAUN, M.P.

Effect of modifying additions on the mechanical properties of cast alloyed steel. Struk.i svois.lit.splav. no.1:45-53 '62.
(MIRA 15:5)

(Steel alloys—Metallurgy)

TIKHONOVSKAYA, L.D.; MATYUSHENKO, N.I.; BRAUN, M.P.

Effect of cerium and boron inoculation on the structure of cast austenitic steel. Struk.i svois.lit.splav. no.1:54-59 '62.
(MIRA 15:5)
(Steel, Heat-resistant—Metallography) (Cerium) (Boron)

GELLER, A.L.; BRAUN, M.P.; VINOKUR, B.B.

Effect of the temperature of heating on the properties of complex-alloy steels. Struk.i svois.lit.splav. no.1:76-81 '62. (MIRA 15:5)

(Steel alloys—Hardening) (Metals, Effect of temperature on)

BRAUN, M.P.; KRUKOVSKAYA, G.N.

Regularities of adsorption in metals and alloys. Struk.i svois. lit.splav. no.1:82-94 '62. (MIRA 15:5)
(Dislocations in metals) (Adsorption)

BRAUN, M.P.

Reducing the brittleness of chromium-manganese-silicon steel by additional complex alloying. Struk.i svois.lit.splav. no.1:95-101 '62. (MIRA 15:5)
(Chromium-manganese steel--Brittleness)

KONDRASHEV, A.I.; BRAUN, M.P.; GELLER, A.L.; VINOKUR, B.B.

Effect of complex alloying on the secondary order temper brittleness of chromium-manganese steel. Struk.i svois.lit.splav. no.1:102-109 '62. (MIRA 15:5)

(Chromium-manganese steel—Brittleness)

KOSTYRKO, O.S.; BRAUN, M.P.

Development of temper brittleness during changes in the cross-section of impact test specimens. Struk.i svois.lit.splav. no.1:110-115 '62. (MIRA 15:5)
(Steel--Brittleness) (Metals, Effect of temperature on)

VINOKUR, B.B.; GELLER, A.L.; BRAUN, M.P.; KONDRASHEV, A.I.

Tendency of high-strength steels toward temper brittleness.
Struk.i svois.lit.splav. no.1:116-124 '62. (MIRA 15:5)
(Steel--Brittleness) (Metals, Effect of temperature on)

MATYUSHENKO, N.I.; MANUYLOVA, V.P.; VINOKUR, B.B.; BRAUN, M.P.

Recrystallization of EI726 cast heat-resistant steel. Struk.i svois.lit.splav. no.1:125-128 '62. (MIRA 15:5)
(Steel castings) (Crystallization)

CHERNYY, V.G.; GUSLIYENKO, Yu.A.; BRAUN, M.P.

Selecting heat-treating conditions for heat-resistant nickel-base foundry alloys. Struk.i svois.lit.splav. no.1:129-134 '62. (MIRA 15:5)

(Nickel alloys--Heat treatment)

37731

S/180/62/000/002/010/018
E040/E135

18.1150

AUTHOR: Braun, M.P. (Kiev)

TITLE: Effect of additional alloying on the strength and ductility of chromium-manganese-silicon steel

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye tekhnicheskikh nauk. Metallurgiya i toplivo, no.2, 1962, 107-112

TEXT: Past investigations showed that multiple alloying of steel is capable of producing a very appreciable improvement in the mechanical strength properties in comparison with those of the same steel but alloyed with single elements only. In many cases, multiple alloying may lead to considerable economies in expensive alloying elements without in any way affecting the usefulness of a given type of steel. The present investigation concerned the steels with the following compositions; Cr-Mn-Si-Cu; Cr-Mn-Si-Cu-Mo; Cr-Mn-Si-Ni-Mo-Ti; Cr-Mn-Si-Ni-Mo-Cu-Ti; and Cr-Mn-Si-Ti-Al. The carbon content of the steels was 0.30-0.37%; the chromium content was from

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1.0-1.3%; the manganese content from 1.0-1.3%; and the silicon content from 1.1-1.3%. In addition, tests were also made on steels containing 2% Cr, 2% Mn and 1.5% Si. The selection of the additional alloying elements was based on the following criteria: 1) analogy in the crystal structure and electronic configuration of copper and nickel; 2) introduction into the test steel of strongly carbide-forming elements (molybdenum and titanium); and 3) joint use of non-carbide-forming alloying elements (Cu and Ni) with carbide-forming elements (Mo, Ti, W). Two further variants of the basic composition of the test steel (Cr-Mn-Si) contained elevated quantities of Cr and Mn and were additionally alloyed with molybdenum and copper and with Ti and Al. It was found that multiple alloying with copper and nickel leads to improvement in the UTS and the yield point of the test steel by 30-35 kg/mm^2 as compared to an average increase in the yield point by only 20-25 kg/mm^2 if alloyed only with either nickel or copper. Addition of nickel on its own to Cr-Mn-Si steel was found to improve effectively the toughness and ductility; the effect of copper is less pronounced in this

respect, whilst addition of both nickel and copper does not result in any improvement of the toughness and ductility of the steel. The improvement of the mechanical strength properties of the test steel was found to depend on the annealing temperature employed; after annealing at 250° the values obtained were: tensile strength σ_b = 185 kg/mm^2, yield point σ_s = 160 kg/mm^2, relative elongation at rupture δ = 10%, relative reduction of area at rupture ψ = 35%, and the impact strength a_k = 8 kgm/cm^2. After annealing at about 400 °C, the combination of the mechanical strength properties of steel was still satisfactory (σ_s = 140 kg/mm^2, ψ = 50%, and impact strength a_k = 6.5 kgm/cm^2). The more highly multiple-alloyed steels (Cr-Mn-Si-Mo-Ti and Cr-Mn-Si-Ni-Cu-Mo-Ti) were found to have a very high UTS and a high yield point if annealed at about 400 °C (σ_b = 170 kg/cm^2, σ_s = 155 kg/mm , ψ = 45% and a_k = 5 kgm/cm^2). Further alloying of steel by means of Ni+Mo+Ti addition offered an unquestionable advantage if the steel was subjected to annealing at 250 °C, in comparison with the results obtained with steel alloyed with copper, nickel or molybdenum, although nickel-alloyed

steel had a slightly higher impact strength. The multiple-alloyed steel has the highest range of yield point values (155-160 kg/mm^2) which exceeds by some 20% the values obtainable by alloying with either nickel, copper or molybdenum only. It is concluded that the above multiple-alloyed steels annealed at low temperatures (250 °C) offer a number of very valuable properties. Similar results were obtained if the steel was annealed at 400 °C, although the ductility and impact strength were slightly inferior to those obtained by alloying with nickel only. The Cr-Mn-Si-Ni-Cu-Mo-Ti steel was found to have a high yield point and high elastic properties after annealing at 250 °C; these properties are retained also after annealing at 600 °C. Further alloying of the Cr-Mn-Si steel with Ni-W-Ti addition was found to favour a considerable improvement in strength properties after annealing at 250-300 °C (σ_s = 160 kg/mm , ψ = 40% and a_k = 8 kgm/cm^2). Steel containing 2% Cr, 2% Mn and 1.5% Si was additionally alloyed with 0.20% Mo and 0.1% Ti and with 0.15% Mo, 0.10% Al and 0.12% Ti and, after low-temperature annealing, was found to have the following strength properties: tensile

Effect of additional alloying on ... S/180/62/000/002/010/018
E040/E135

strength σ_b = 210 kg/mm^2, yield point σ_s = 200 kg/mm^2, reduction in area ψ = 22-35%, impact strength a_k = 6-8 kgm/cm^2. In general, additional alloying with complex alloys consisting of Ni+Mo+Ti, Ni+Cu+Mo+Ti and Ni+W+Ti was found to be very beneficial and the Cr-Mn-Si steels thus alloyed were found to give good mechanical properties, especially after annealing at 250-280 °C. The author concludes that the main advantage of multiple alloying of the Cr-Mn-Si steel lies in the possibility of achieving a significant improvement in the ductility and strength after low temperature annealing and therefore the above multiple-alloyed steels are recommended for a variety of industrial applications.
There are 2 figures and 3 tables.

SUBMITTED: October 6, 1961

Card 5/5

BRAUN, M.P., doktor tekhn.nauk; VINOKUR, B.B., inzh.; SEVRUK, B.A., inzh.; EL'KINA, T.P., inzh.; SOKOL, A.N., kand.tekhn.nauk; ZALETSKIY, G.I., kand.tekhn.nauk; MIROVSKIY, E.I., inzh.

Replacing the chrome-nickel steel 20KhN3A with the carburizing steel 20KhGSVT. Mashinostroenie no.3:58-62 My-Je '62. (MIRA 15:7)
(Steel alloys—Testing)

BRAUN, M.P., doktor tekhn.nauk, prof.; VINOKUR, B.B., inzh.; KONDRASHEV, A.I., inzh.; KOSTYRKO, O.S., inzh.

Principles of the alloying of steel. Metalloved. i term. obr. met. no.5:26-29 My '62. (MIRA 15:5)

1. Kiyevskiy politekhnicheskiy institut.
(Steel alloys—Metallurgy)

S/021/62/000/006/009/013
D251/D308

AUTHOR: Braun, M.P.

TITLE: The effect of additional alloying on the strength and plasticity of chrome-manganese-silicon steel

PERIODICAL: Akademiya nauk Ukrayins'koyi RSR. Dopovidi, no. 6, 1962, 774 - 777

TEXT: The effect on the strength, viscosity and plasticity of chrome-manganese-silicon steel produced by additional alloying with small traces (of the order of 1 %) of the following elements and complexes: Cu, Ni, Mo, Ni + Cu, Ni + Mo + Ti and Ni + Cu + Mo + Ti is investigated. Technical details of preparation of the specimens and the alloying process are given and the results, in dependence on the temperature of annealing are presented graphically. Some remarks on the theoretical basis of the phenomena observed are adduced, based on the theory of outer-shell electrons. It is shown that it is possible to enhance the strength of steel by means of alloying with complexes such as Ni + Mo + Ti and Ni + Cu + Mo + Ti, and that such steels have physical properties comparable to those with high molyb-

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The effect of additional alloying ...

denum and nickel content. The use of such complex-alloy steels, which contain at the most 1 % Ni and 0.5 % Mo instead of steels with high nickel and molybdenym content is recommended from an economic point of view.

ASSOCIATION: Instytut lyvarnoho vyrobnytstva AN URSR (Institute of Casting Production of the AS UkrSSR)

PRESENTED BY: M.M. Dobrokhotov, Member of the AS UkrSSR

SUBMITTED: November 13, 1961

41558

S/148/62/000/008/005/009

18.82.00 E071/E483

AUTHORS: Braun, M.P., Vinokur, B.B., Geller, A.L.

TITLE: The effect of additional alloying additions on hardenability of chromium-manganese steels

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya, no.8, 1962, 128-134

TEXT: The range of application of Cr-Mn steels can be greatly increased by introducing additional carbide-forming alloying elements that improve their mechanical properties without adversely affecting their temper brittleness. To assess the suitability for the fabrication of large forgings of alloyed Ni-free Cr-Mn steels, it was necessary to compare their hardenability with that of other Ni-bearing materials used at present for this purpose - hence the present investigation conducted on the steels as shown in Table 1. Hardenability was determined by the standard Jominy end-quench test, its results being expressed in terms of both the critical diameter and the hardness/distance from the quenched end graphs. The 30Х2Г2МТ (30Kh2G2MT) and 30Х2ГМТ (30Kh2GMT) steels had the highest

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hardenability which was so high that the critical diameter for these steels could not be calculated from data obtained on the standard specimens (25 mm in diameter). For the other steels the critical diameters were: 170 mm for 40XH (40KhN), 220 mm for 30XГBT (30KhGVT) and 350 to 370 mm for 35XHM (35KhNM), 40XГBT (40KhGVT) and 30XГBM (30KhGVM). The ideal critical diameters, calculated by the method entailing the use of a multiplying factor for each alloying element are shown in Table 2. This method, while useful for screening purposes, is not very accurate. Much better results can be obtained by superimposing the cooling curves, constructed for various points on the cross-sections of specimens of various diameters, on the thermo-kinetic diagrams (as opposed to the TTT curves) of the martensitic transformation of the appropriate steels. By this means accurate information can be obtained not only on the critical diameter but also on the structure obtained under various conditions of specimen size and cooling rate. The use of this method was demonstrated on several of the steels studied, the appropriate diagrams being reproduced in the present paper.

Conclusion: the steels 30Kh2G2MT and 30Kh2GMT could replace the Ni-bearing steels in the fabrication of large forgings. There are 2 figures and 2 tables.

ASSOCIATION: Ukrainskaya Akademiya sel'skokhozyaystvennykh nauk (Ukrainian Academy of Agricultural Sciences)

SUBMITTED: November 15, 1960

Table 1.

Сталь	C	Si	Mn	Cr	W	Mo	Ti	Ni	S	P
30ХГВТ	0,33	0,42	1,17	1,15	0,77	—	0,09	0,20	0,015	0,022
30ХГВМ	0,31	0,25	1,05	1,15	0,83	0,24	—	0,23	0,016	0,029
30Х2ГМТ	0,28	0,32	1,10	1,84	—	0,49	0,08	0,35	0,029	0,030
30Х2Г2МТ	0,31	0,47	1,52	2,05	—	0,35	0,12	0,21	0,020	0,028
40ХГВТ	0,41	0,53	0,96	1,21	0,82	—	0,08	0,23	0,016	0,030
40ХН	0,39	0,33	0,59	1,25	—	—	—	1,56	0,030	0,019
35ХНМ	0,37	0,24	0,69	1,65	—	0,29	—	1,73	0,029	0,019

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BRAUN, M.P.

Isothermal transformation of austenite in a complex-alloy steel.
Izv.vys.ucheb.zav.; chern.met. 5 no.6:113-119 '62. (MIRA 15:7)

1. Ukrainskaya akademiya sel'skokhozyzystvennykh nauk.
(Steel alloys—Metallography)

37206
S/126/62/013/004/020/022
E091/E435

ID. 1152

AUTHORS: Braun, M.P., Gusliyenko, Yu.A., Chernyy, V.G.

TITLE: Fine crystal structure of a highly alloyed nickel-base casting alloy

PERIODICAL: Fizika metallov i metallovedeniye, v.13, no.4, 1962, 626-631

TEXT: The factors determining the mechanical properties of a heterogeneous highly alloyed refractory nickel-base casting alloy, containing W, Mo, etc as alloying elements were studied. By means of X-ray analysis (using Cu, Cr and Co irradiations), the dependence on temperature and soaking time prior to quenching of the dimensions of the regions of coherent scatter of X-rays (mosaic blocks) in the matrix and the intermetalloid phase, of the crystal lattice parameters and their degree of inhomogeneity and of the degree of third-order distortions of the crystal lattices of the intermetalloid and of the matrix, were studied. The composition of the carbide phases was also investigated. The dimensions of the intermetalloid phase blocks were determined from the width of the interference lines (111); those of the

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Fine crystal structure ... ,

mosaic blocks of the matrix and the inhomogeneity of its lattice parameter were determined by means of harmonic analysis of the form of interference of (111). The dimensions of the mosaic blocks of the matrix were also determined from the change in integral intensity of the line (111). The modulus of elasticity was determined by means of an ultrasonic apparatus, using a dynamic method. The characteristic temperature and the value of the mean square deviations of atoms in the lattice was found by calculation from the values of the moduli of elasticity. The linear grain sizes of the alloy were measured by counting the units on a microsection plateau. The U.T.S. in tension was determined on a universal 30 ton Baldwin-type machine; the hardness was measured on a ТП(TP)-type (Vickers) machine, by means of a diamond pyramid at a load of 30 kg. The microstructure of the alloy was studied by means of a МИМ-7 (MIM-7) microscope. The intermetalloid and carbide phases were studied in the isolated state. It was found that the mosaic blocks in and the quantity of the intermetalloid phase after quenching the alloy from 1150 to 1180°C remain the same as in the original as-cast state.

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206810012-1"

Fine crystal structure ...

Quenching from above 1200°C led to a reduction of the γ-phase blocks. Quenching of the alloy from 1200 and 1280°C resulted in an increase in the quantity of γ'-phase; the degree of third order distortion of this phase remained practically constant in the entire quenching temperature range. The inhomogeneity of crystal lattice parameter decreased with increase in quenching temperature up to 1180°C. Quenching from 1200°C resulted in a sharp increase of the degree of inhomogeneity of crystal lattice parameter; the concentration inhomogeneity remained constant with further increase in temperature, up to 1280°C. The modulus of elasticity remained constant after quenching from 1150 to 1280°C. The characteristic temperature is within the limits 445 to 455°C. Quenching from 1150 to 1200°C did not cause great changes in hardness. The results of microstructural studies of the alloy confirmed the results of X-ray investigation. It is concluded that the improvement in strength and refractoriness of the alloy investigated after quenching from 1200 to 1250°C is due essentially to a change in quantity, state and distribution of the intermetalloid phase. There is 1 figure.

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Fine crystal structure ...

S/126/62/013/004/020/022
E091/E435

ASSOCIATION: Institut liteynogo proizvodstva AN UkrSSR
(Institute of Foundry Production AS UkrSSR)

SUBMITTED: June 17, 1961 (initially)
November 1, 1961 (after revision)

Card 4/4

BRAUN, M.P., doktor tekhn.nauk; VINOKUR, B.B., inzh.; MATYUSHENKO, N.I., inzh.; MANUYLOVA, V.P., inzh.

Efficient conditions for shaping and heat treatment of heat-resistant austenite steel. Mashinostroenie no.4:32-36 Jl-Ag '62. (MIRA 15:9)

1. Institut liteynogo proizvodstva AN UkrSSR.
(Steel--Heat treatment)

S/148/62/000/012/007/008
E193/E383

AUTHORS: Braun, M.P., Vinokur, B.B., Kondrashev, A.I. and Geller, A.L.

TITLE: Search for nickel-free constructional steels

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Chernaya metallurgiya, no. 12, 1962, 126 - 130

TEXT: Cr-Ni steels, widely used in the heavy machine tool-building industry, although characterized by good hardenability, are prone to temper-brittleness. The standard method of preventing this effect is to alloy the steel with Mo. The object of the present investigation was to find out whether nickel-free steels with properties similar to those of Cr-Ni-Mo steels could be developed. The composition of Ni-free and Ni-bearing steels used in the experiments is given in Table 1. The effect of tempering temperature on the impact strength a_k of the steels in the ductile (i.e. rapidly cooled) and brittle (slowly cooled) condition was studied in the first series of experiments. In this respect, the (Mo + Ti) addition was found to be the most effective. Steel 30Х2ГМТ (30Kh2GMT), tempered at 400 - 500 °C, had $a_k \simeq 4$ kgm/cm^2;

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Search for ....

a_k rapidly increased on increasing the tempering temperature, reaching a value of about 21 kgm/cm^2 after tempering at 675 °C; the difference between a_k of this steel in the brittle and ductile condition was negligible for the entire range of tempering temperatures studied. For comparison, a_k of steel 40ХН (40KhN), tempered at 675 °C, was 13 kgm/cm^2 for the ductile and 6.5kgm/cm^2 in the brittle condition. a_k of the steels at sub-zero temperatures was studied in the next series of experiments. The measurements were carried out on specimens hardened and tempered to produce UTS of 100 kg/mm^2; ductile and brittle conditions were attained, respectively, by water-quenching the specimen after tempering and by cooling at 30 °C/h. Here again, the steel 30Kh2GMT gave the best results, its a_k, in the ductile condition at +80, +40, 0, -80 and -160 °C, being, respectively, 19, 17, 14, 10, 8 and 5 kgm/cm^2. The greatest difference between the value of a_k for the ductile and brittle conditions did not exceed 5 kgm/cm^2. Steel 40KhN in the ductile condition had

Search for ....

a_k = 14 kgm/cm^2 at 80 °C and 2 kgm/cm^2 at -160 °C, the corresponding values for the brittle condition being 7 and 0.5 kgm/cm^2. The relative proneness of the steels studied to brittle fracture is demonstrated in Table 4, showing the values of the "cold-brittleness threshold" defined as the temperature at which a_k of the steel constituted 50% of its value at room temperature. Conclusions: 1) Ni-free (Cr-Mn)-bearing steels with additional alloying elements show little tendency to brittle fracture and in this respect are similar to the Cr-Ni-Mo steel 35ХНМ (35KhNM). The ductility of these two types of steel at sub-zero temperatures is also comparable. 2) The results of studies of the mechanical properties (M.P. Braun et al - Metallovedeniye i termicheskaya obrabotka metallov, 1960, no. 12; Izvestiya vysshikh uchebnykh zavedeniy, Chernaya metallurgiya, 1961, no. 8) and data on temper-brittleness, notch-sensitivity and ductile-to-brittle transition temperature (Braun et al, Izv. AN SSSR, OTN, 1961, no.4) of the steels 30ХГСВТ (30KhGSVT) and 30Х2МГТ (30Kh2MGT) indicate that these steels can be recommended as construction materials for large parts. There are 2 figures and 4 tables.

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S/148/62/000/012/007/008
E193/E383

Search for ....

ASSOCIATION: Ukrainskaya akademiya sel'skhokhozyaystvennykh nauk (Ukrainian Academy of Agricultural Sciences)

SUBMITTED: April 10, 1962

Table 1:

Type of steel	C	Si	Mn	Cr	Ni	W	Mo	Ti
30KhGVT	0.33	0.42	1.17	1.15	-	0.75	-	0.09
30KhGVM	0.31	0.25	0.05	1.10	-	0.75	0.75	-
30Kh2GMT	0.28	0.32	1.10	1.84	-	-	0.49	0.08
35KhNM	0.37	0.24	0.69	1.65	1.73	-	0.29	-
40KhN	0.39	0.33	0.59	1.25	1.56	-	-	-

Contents of S and P = 0.022 - 0.29%

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Search for ....

S/148/62/000/012/007/008"
E193/E383

Table 4:

Type of steel	Ductile condition		Brittle condition	
	Cold-brittleness threshold	Temperature interval	Cold-brittleness threshold	Temp. interval
30KhGVT	-75	35	-60	35
30KhGVM	-100	55	-50	50
30Kh2GMT	-90	35	-70	35
35KhNM	-95	35	-85	35
40KhN	-45	90	-20	100

Card 5/5

BRAUN, M. P.; VINOKUR, B. B.; KONDRASHEV, A. I.; GELLER, A. L.

Search for a nickel-free structural steel. Izv. vys. ucheb. zav.; chern. met. 5 no.12:126-130 '62. (MIRA 16:1)

1. Ukrainskaya akademiya sel'skokhozyaystvennykh nauk.

(Steel, Structural—Testing)
(Chromium-manganese steel—Brittleness)

S/148/63/000/001/015/019
E071/E151

AUTHORS: Braun, M.P., Vinokur, B.B., and Ivanov, F.I.

TITLE: Transformation of supercooled austenite in steels of different degree of alloying

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Chernaya metallurgiya, no.1, 1963, 128-135

TEXT: The effect of alloy composition on the transformation of supercooled austenite was studied using 14 stock alloy steels containing Mn (0.32-1.44%), Cr (0.28-1.88%), Ni (0.15-3.02%) and, in some cases, W (0.47-0.52%) or Mo (0.29-0.59%) in addition. Transformation diagrams are given for isothermal conditions and for continuous cooling, and also data on hardenability and mechanical properties. From the observed similarity in behaviour of steels in which nickel, chromium or manganese predominated, it was concluded that chromium or manganese could replace nickel, and that the transformation kinetics, hardenability and mechanical properties of chromium-manganese steel were not inferior to those of a corresponding nickel-chromium steel. Similar degrees of alloying gave similar mechanical properties, e.g. in groups of steels in

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which the total alloy additions (Mn, Cr, Ni, W and Mo) were about 3.5% and 5% respectively. From the transformation diagrams and the mechanical data it was considered possible to determine the dimensions of parts to give the necessary mechanical properties, and to produce steels containing low proportions of scarce (e.g. nickel) or expensive elements for parts such as forgings of various sizes, including very large ones.
There are 1 figure and 4 tables.

ASSOCIATION: Ukrainskaya akademiya sel'skokhozyaystvennykh nauk (Ukrainian Academy of Agricultural Sciences)

SUBMITTED: January 23, 1961

BRAUN, M. P., doktor tekhn. nauk; KRUKOVSKAYA, G. I., inzh.

Convertible temper brittleness in chromium-silicon-manganese steel castings. Mashinostroenie no.5:54-57 S-O '62. (MIRA 16:1)

1. Institut liteynogo proizvodstva AN UkrSSR.

(Steel castings)

BRAUN, M. P. (Kiyev); MATYUSHENKO, N. I. (Kiyev)

Effect of niobium and zirconium on the structure of cast austenitic steel. Izv. AN SSSR. Otd. tekh. nauk. Met. i topl. no.6:81-89 N-D '62. (MIRA 16:1)

(Chromium-nickel steel—Metallography)

BRAUN, M.P.; GUSLIYENKO, Yu.A.; CHERNYY, V.G.

Fine crystal structure of a complex, nickel-base, foundry alloy. Fiz. met. i metalloved. 13 no.4:626-631 Ap '62. (MIRA 16:5)

1. Institut liteynogo proizvodstva AN UkrSSR.
(Nickel alloys—Metallography)

BRAUN, Mikhail Petrovich; VINOKUR, Bertol'd Bentsionovich; CHERNYY, Viktor Gavrilovich; CHERNOVOL, Arkadiy Vasil'yevich; KOSTYRKO, Oleg Stepanovich; ALEKSANDROVA, Natal'ya Pavlovna; KRUKOVSKAYA, Galina Nikolayevna; TIKHONOVSKAYA, Larisa Dmitriyevna; LYASHENKO, Lyudmila Aleksandrovna; FIKSEN, N.V., kand. tekhn. nauk, otv. red.; POKROVSKAYA, Z.S., red.; KADASHEVICH, O.A., tekhn. red.

[Alloys with addition elements] Legirovannye splavy. [By] M.P. Braun i dr. Kiev, Izd-vo AN Ukr.SSR, 1963. 142 p. (MIRA 16:8)

(Alloys--Metallurgy)
(Foundries--Equipment and supplies)

BRAUN, Mikhail Petrovich; VINOKUR, Bentsikhanovich; KONDRASHEV, Arkadiy Ivanovich; GELLER, Aleksandr L'vovich; FIKSEN, N.V., kand. tekhn. nauk, retsenzent; FURER, P.Ya., red.; GORNOSTAYPOL'SKAYA, M.S., tekhn.red.

[Properties of complex-alloy steel for the manufacture of large-section parts] Svoistva kompleksnolegirovannykh stalei dlia izdelii krupnykh sechenii. Moskva, Mashgiz, 1963. 207 p. (MIRA 16:8)

(Steel alloys—Testing)
(Machinery--Design and construction)

BRAUN, M.P., doktor tekhn. nauk; KOSTYRKO, O.S., inzh.

Effect of dimensions of heat-treated specimens on the impact toughness of 40KhNL steel. Mashinostroenie no.3:24-26 My-Je '63. (MIRA 16:7)

(Steel--Testing)

L 10388-63 EDS/EWP(q)/EWT(m)--AFFTC/ASD--JD
ACCESSION NR: AP3001054 S/0148/63/000/004/0124/0128

36
53

AUTHOR: Braun, M. P.

TITLE: Effect of alloying elements on the strength, ductility, and hardenability of Si-Mn structural steel

SOURCE: IVUZ. Chernaya metallurgiya, no. 4, 1963, 124-128

TOPIC TAGS: Si-Mn steel, V, Ti, B, Mo, Ni, Cu, complex alloying

ABSTRACT: The effect of alloying with V, Ti, B, Mo, Ni, and Cu on the mechanical properties of Si-Mn steel containing 0.32-0.36 C, 1.30-1.60% Mn, and 1.35-1.60% Si has been investigated. None of the alloying elements produced any considerable improvement in both strength and ductility when used separately. Only complex alloying with Cu, Mo, and Ti yielded a steel with a considerably better hardenability than that of the base Si-Mn steel and a very favorable combination of mechanical properties in the heat-treated condition. Forged rounds of Si-Mn-Cu-Mo-Ti steel (0.33% C, 1.29% Si, 1.42% Mn, 0.10% Ti, 0.20% Mo, and 0.60% Cu) 300 mm in diameter, oil quenched and tempered at 550C,

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L 10388-63
ACCESSION NR: AP3001054

had a tensile strength of 102.2 kg/mm sup 2, a yield strength of 84.0 kg/mm sup 2, an elongation of 14.7%, a reduction of area of 53.3%, and a notch toughness of 10.0 mkg/cm sup 2. The same values were found at a depth of 100 mm. The steel is not very susceptible to temper brittleness; only in tempering at 500C did slow cooling lower the notch toughness by about 30%. Complex alloying with Cu, Mo, and Ti also lowered the temperature of the nil-ductility transition. The notch toughness of the Si-Mn-Cu-Mo-Ti steel at -40C was 7 mkg/cm sup 2. Orig. art. has: 4 figures.

ASSOCIATION: Ukrainskaya Akademiya sel'skokhozyaystvennykh nauk (Ukrainian Academy of Agricultural Sciences)

SUBMITTED: 03Jan62 DATE ACQ: 11Jun63 ENCL: 00

SUB CODE: 00 NO REF SOV: 002 OTHER: 000

Card 2/2 ph/W

BRAUN, M.P.; VINOKUR, B.B.; IVANOV, F.I.

Transformations of undercooled austenite in steels with a varying degree of alloying. Izv.vys.ucheb.zav.; chern.met. 6 no.1:128-135 '63. (MIRA 16:2)

1. Ukrainskaya akademiya sel'skokhozyaystvennykh nauk.
(Steel alloys—Metallography) (Phase rule and equilibrium)

BRAUN, M.P., doktor tekhn.nauk; VINOKUR, B.B., inzh.

Optimum conditions for annealing 30KhGVT steel. Mashinostroenie no. 2:57-59 Mr-Ap '64. (MIRA 17:5)

BRAUN, M.P.

Structure of overheated alloy and complex-alloy steel. Izv. vys. ucheb. zav.; chern. met. 7 no.2:140-146 '64.
(MIRA 17:3)

1. Ukrainskaya akademiya sel'skokhozyaystvennykh nauk.

BRAUN, M.P.; LYASHENKO, L.A.

Studying the phase constitution of cast, complex-alloy austenitic steel. Fiz. met. i metalloved. 16 no.5:714-717 N '63. (MIRA 17:2)

1. Institut liteynogo proizvodstva AN UkrSSR.

BRAUN, M.P., doktor tekhn.nauk; VINOKUR, B.B., inzh.

Changes in properties of the 30KhGVT steel depending on tempering time. Mashinostroenie no.4:34-35 Jl-Ag '63. (MIRA 17:2)

BRAUN, M.P.; VINOKUR, B.B.; KONDRASHEV, A.I.; GELLER, A.L.

Chromium-manganese steel for large forgings. Metalloved. i term. obr. met. no.10:1-9 O '63. (MIRA 16:10)

1. Institut liteynogo proizvodstva AN UkrSSR.

BRAUN, M.P.; TIKHONOVSKAYA, L.D.; MATYUSHENKO, N.I.

Effect of cerium and boron on the structure of cast austenitic steel. Issl. po zharoproch. splav. 10:207-214 '63. (MIRA 17:2)

L 34557-65 EWT(m)/EWP(w)/EWA(d)/T/EWP(t)/EWP(b) MJW/JD

ACCESSION NR: AR5004785 S/0137/64/000/010/I046/I046

SOURCE: Ref. zh. Metallurgiya, Abs. 10I299

AUTHOR: Braun, M. P.; Vinokur, B. B.; Sevruk, B. A.; El'kina, T. P.; Sokol, A. M.; Zaletskiy, G. I.; Mirovskiy, E. I.

TITLE: Properties of 20KhGSVT non-nickel steel

CITED SOURCE: Sb. Legirovaniye staley. Kiyev, Gostekhizdat USSR, 1963, 32-40

TOPIC TAGS: metal mechanical property, steel hardening, temperature dependence, nickel economy, cementation, heat treatment, 20KhGSVT steel, 20KhNZA steel

TRANSLATION: A study of the effect of hardening temperature (880, 930, and 980°) on the mechanical properties of 20KhGSVT cemented steel (containing in %: 0.2 carbon, 1.26 manganese, [illegible] 0.87 silicon, 0.82 tungsten, 0.09 titanium) showed that with an increase in this temperature the strength properties increase and ductility decreases. Tempering of normalized samples at [illegible]

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L 3[illegible] 57-65

ACCESSION NR: AR5004785

leads to practically no change in sigma$_b$, while tempering up to 400° /Translator's note: Word apparently missing here./ sigma$_s$. After tempering at temperatures above 400° the strength properties decrease, while malleability and ductility increase. After hardening from 900° and tempering at 500 and 600° a slight tendency towards temper brittleness develops. Tempering at 650° leads to a 35% decrease in a_k as a result of slow cooling. However, even in the brittle state the steel has an a_k equal to 8-9 kgm/cm^2. After hardening from 900° and tempering at 600°, a_k is greater than 4 kgm/cm^2 at -115°. A study of the tendency of 20KhGSVT steel toward cementation under various conditions showed that it has more of a tendency toward cementation than 20KhNZA steel. It is recommended that 20KhGSVT steel be substituted for 20KhNZA steel. I. Tulupova.

SUB CODE: MM ENCL: 00

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L 14009-65 EWT(m)/EWA(d)/EWP(t)/EWP(b) /PTC(p) MJW/JD

ACCESSION NR: AR4045892 S/0137/64/000/007/I057/I057

SOURCE: Ref. zh. Metallurgiya, Abs. 7I361

AUTHOR: Sokol, A. N.; Mirovskiy, E. I.; Braun, M. P.; Vinokur, B. B.; Popov, N. V.; Kalinichev, M. A.

TITLE: Non-nickel alloy steels for heavily loaded parts

CITED SOURCE: Sb. Legirovaniye staley. Kiyev, Gostekhizdat USSR, 1963, 41-46

TOPIC TAGS: alloy steel, load, steel bolt, connecting rod bolt, bolt

TRANSLATION: The structure and properties of 40KhN, 40Kh, 45G2, and 30KhGSA steels were investigated for the purpose of choosing the correct material for connecting rod bolts. Practical tests were also carried out of connecting rod bolts under elongation and with cyclic elongation-compression loads at a frequency of 1,000 cycles/min under a stress on a minimum cross section area of the bolt of 20-24 kg/mm^2. Elongation tests showed that 45Kh, 45G2, and 30 KhGSA steels guarantee the required strength of the bolt. In fatigue tests, the largest

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L 14009-65

ACCESSION NR: AR4045892

number of cycles up to destruction was registered for 30KhGSA steel, which also showed the minimum sensitivity to a concentration of stresses. The series of tests showed that the use of 40KhN steel for connecting rod bolts is not recommended. Based on data for strength, hardenability, and structure, the use of 30KhGSA steel is recommended.

SUB CODE: MM, AS ENCL: 00

Card 2/2

ACCESSION NR: AT4022203 S/0000/63/000/000/0046/0051

AUTHOR: Aleksandrov, A. G.; Braun, M.P.

TITLE: Structure and properties of cast austenitic steel of complex composition

SOURCE: AN UkrRSR. Insty*tut ly*varnogo vy*robny*tstva. Konstruktsionny*ye i zharoprochny*ye splavy* (Structural and heat-resistant alloys). Kiev, Izd-vo AN UkrSSR, 1963, 46-51

TOPIC TAGS: cast steel, austenitic steel, cast austenitic steel, complex cast austenitic steel, steel, nickel-free steel

ABSTRACT: High temperature, nickel-free alloys are widely used in industry, and many investigations have been reported on their composition and properties. Mostly, however, these alloys are either in the ferrite or austenite-ferrite class. In the present investigation, the authors attempt to check the possibility of melting several high temperature, nickel-free alloys in ovens with acid linings in order to obtain high viscosity and plasticity and thus provide a cheap way for the additional introduction of alloys. The high temperature, nickel-free alloys previously used had a low impact viscosity in the cast condition when melted in electric ovens with acid linings. High temperature alloys with a manganese content of 11-13% and a chromium content of 8-10% may be

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ACCESSION NR: AT4022203

melted in ovens with acid linings without impairing their properties. As shown in Figs. 1 and 2 of the Enclosure, the alloy Fe-Cr-Mn-Si-Al ensures high resistance to oxidation up to 1,000C even with a low content of Si or Al. When this heat resistant Fe-Cr-Mn-Si-Al alloy is melted in an electric oven with an acid lining, it has a sufficiently high viscosity in the liquid state so that it may be used for casting containers for annealing wrought iron and oven parts. "All tests and investigations were performed by Engineers D. Kh. Mezuzhakova, I. M. Gol'verk, M. N. Berkun, A. I. Sapelkina and L. M. Kurbenko." Orig. art. has: 2 figures and 2 tables.

ASSOCIATION: Insty*tut ly*varnogo vy*robny*tstva AN UkrSSR (Institute of Foundry Technology, AN UkrSSR)

SUBMITTED: 00 DATE ACQ: 19Mar64 ENCL: 02

SUB CODE: ML, MA NO REF SOV: 014 OTHER: 000

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Card

ACCESSION NR: AT4022203

ENCLOSURE: 01

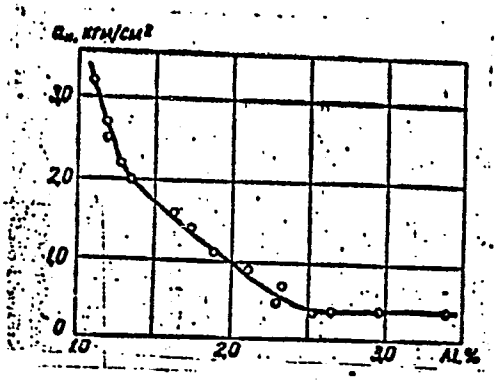

Fig. 1 - Change in impact viscosity of Fe-Cr-Mn-Si-Al alloy in relation to aluminum content (with constant chromium, manganese and silicon content).

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ACCESSION NR: AT4022203

ENCLOSURE: 02

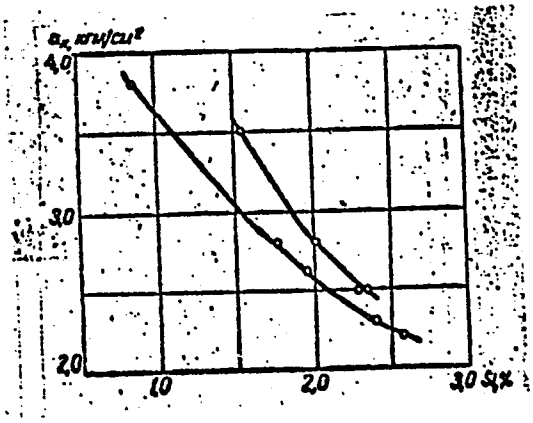

Fig. 2 - Change in impact viscosity of Fe-Cr-Mn-Si-Al alloy in relation to silicon content (with constant chromium, manganese and aluminum content)

Card 4/4

ACCESSION NR: AT4022204 S/0000/63/000/000/0052/0056

AUTHOR: Lyashenko, L. A.; Braun, M.P.

TITLE: Relative heat resistance of cast austenitic steel of complex composition

SOURCE: AN UkrRSR. Insty*tut ly*varnogo vy*robny*tstva. Konstruktsionny*ye i zharoprochny*ye splavy* (Structural and heat-resistant alloys). Kiev, Izd-vo AN UkrSSR, 1963, 52-56

TOPIC TAGS: alloy heat resistance, austenitic steel, complex austenitic steel, cast austenitic steel, cast steel, steel, heat resistance

ABSTRACT: There are many high temperature alloys currently being used in industry. However, they are all usually machined. Since cast structures have many advantages over forged ones, the centrifugal testing method proposed by Prof. I. I. Kornilov was used to investigate the relative heat resistance of austenitic cast steel of varying composition. Data were obtained on the relative heat resistance of iron-chromium steel with successive additions of tungsten, molybdenum, niobium, titanium and aluminum. As shown in the Enclosure, steel containing tungsten, molybdenum and niobium had the highest heat resistance. Orig. art. has: 3 figures and 2 tables.

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ACCESSION NR: AT4022204

ASSOCIATION: Insty*tut ly*varnogo vy*robny*tstva AN UkrSSR. (Institute of Foundry Technology, AN UkrSSR)

SUBMITTED: 00 DATE ACQ: 19Mar64 ENCL: 01

SUB CODE: ML NO REF SOV: 005 OTHER:. 000

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